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THESIS

**EARLY SYNTHETIC PROTOTYPING: THE USE OF
VIDEO AFTER-ACTION REPORTS FOR HARVESTING
USEFUL FEEDBACK IN EARLY DESIGN**

by

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June 2016

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REPORTS FOR HARVESTING USEFUL FEEDBACK IN EARLY DESIGN**

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ABSTRACT

Early Synthetic Prototyping (ESP) is a new concept in which capability and material developers use an online game to crowdsource ideas from online players in order to increase viable synthetic prototypes. In entertainment games, players often create videos of their game play to share with other players to demonstrate how to complete a segment of a game. This thesis explores similar self-recorded videos of ESP game play and determines if they provide useful data to capability and material developers that can influence the early design process, or if the videos affect the ESP process itself.

The study shows that user videos affect player behavior as well as increase engagement and entertainment for the players, which serves to maintain a large player population essential to ESP success. The exact reasons for increased engagement and entertainment are unclear and are topics for further investigation. These results are important to ESP developers because if ESP game developers can increase the engagement and fun in playing their games, it will increase participation and willingness to contribute ideas and strategies with other players. The increase in contributions and participation will then lead to an increase in the number of early prototypes that can be analyzed and potentially used.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAR	after action report
AI	artificial intelligence
AMSO	Army Modeling and Simulation Office
AOC	Army Operating Concept
ARCIC	Army Capabilities Integration Center
ASA(ALT)	United States Assistant Secretary of the Army for Acquisition, Logistics, and Technology
COA	course of action
DOD	Department of Defense
ESA	Entertainment Software Association
ESP	Early Synthetic Prototyping
LP	Let's Play
MOVES	Modeling, Virtual Environments and Simulations
NPS	Naval Postgraduate School
OPFOR	opposing forces
OSD	Office of Secretary of Defense
PZ	pickup zone
QRF	quick reaction force
TRADOC	Training and Doctrine Command
VBS3	Virtual Battlespace 3

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EXECUTIVE SUMMARY

For the first time in 40 years, the Army has updated its operating concept, which is a shift from how to “fight, outnumber, and win” to how to “win in a complex world” (Perkins, 2014). In order to win in a complex world, the Army will need to not only anticipate future threats but also innovate in order to ensure its forces are able to bring overmatching capabilities to bear on its enemies. (U.S. Army Training and Doctrine Command [TRADOC], 2014). One way the Army seeks to improve and speed up its innovation is with Early Synthetic Prototyping (ESP).

ESP is a new concept in which capability and material developers use an online game to crowdsource ideas from online players in order to increase the viability of synthetic prototypes. One current trend in online game communities is the creation and sharing of self-recorded game play videos. Since ESP will be an online game, users may create self-recorded videos of their game play for other users to watch. This thesis seeks to answer the following questions with regard to user created videos in an ESP game community:

1. Is it reasonable to expect ESP game players to create and narrate game play video after action report (AAR)s?
2. Does availability of game play video AARs increase user feedback and participation in ESP game play?
3. Will game play video AARs provide useful feedback to developers?
4. Will game play video AARs provide useful information to other players and enhance the game play?

In order to answer these questions, the author conducted a human-in-the-loop study with two groups playing an ESP-style military game. The first group conducted a mission and then recorded a game play video. The second group watched the videos, and then played the game.

Results of the study show that the user videos affect the players’ behavior as well as created a more entertaining environment for the players than one without videos. The exact reasons why the videos increased the fun players had within the environment are

unknown and future studies should further investigate the cause. These results are important to ESP developers because if ESP game developers can increase the fun in their games, it should increase overall participation and buy-in of their players. (Vogt, Megiveron, & Smith, 2015). The increase in buy-in and participation should lead to more opportunities for developing and testing.

References

- Department of the Army, Training and Doctrine Command (TRADOC). (2014). *The U.S. Army Operating Concept—Win in a Complex World*. (TRADOC Pamphlet 525–3-1). Fort Eustis, VA: U.S. Army Training and Doctrine Command.
- Perkins, D. (2014). Army Operating Concept and Force 2025 & Beyond. [PowerPoint slides]. Retrieved from <http://www.benning.army.mil/mcoe/maneuverconference/2014/presentation/pdf/genperkins.pdf>
- Vogt, B., Megiveron, M., & Smith, R. (2015). Early Synthetic Prototyping: When We Build It, Will They Come? In *Proceedings of the Interservice/Industry Training Simulation and Education Conference (I/ITSEC) 2015*. Orlando, FL. Retrieved from: <https://www.milsuite.mil/book/docs/doc-220993>

I. INTRODUCTION

Since the early 1980s and prior to the newly published Army Operating Concept (AOC), the United States Army used the Airland Battle Doctrine as a blueprint for how it would equip an Army designed to fit a known enemy on a known terrain. (Perkins 2014). Over the past decade, the operational environment that the Army fights in has changed and thus, the operating concept has changed as well. According to the new AOC, “the environment the Army will operate in is unknown. The enemy is unknown, the location is unknown, and the coalitions involved are unknown” (TRADOC, 2014, p. iii). The title of the new AOC and the problem the Army is now faced with solving is how to “Win in a Complex World” (TRADOC, 2014).

In the Army’s newly published AOC, “complexity is defined as an environment that is not only unknown, but unknowable and constantly changing. The Army cannot predict who it will fight, where it will fight, and with what coalition it will fight” (TRADOC, 2014, p. iii). This new operating concept will require the institutional Army to be more adaptive and innovative in its mission to equip and train the operational Army “to ensure that Army forces are manned, trained, and equipped to overmatch enemies in order to seize, retain, and exploit the initiative” (p. iv).

The Army defines “overmatch” as the “application of capabilities or use of tactics in a way that renders an adversary unable to respond effectively” (TRADOC, 2014, p. 9). As technology proliferation increases, the adversarial forces that the Army will face can diminish the Army’s technological advantage in two ways. They can either use new technologies to increase their own or mitigate the Army’s capabilities. This could in turn then lead to either an enemy overmatch or the loss of the Army’s overmatch. The Army aims to prevent this loss of overmatch by rapidly developing new capabilities. Therefore, as the need to speed up the development of new capabilities to field to the operating force becomes increasingly important, the institutional Army seeks to use innovation to solve this problem (TRADOC, 2014).

Innovation is a key tenet of the Army and the one that it seeks to use to maintain overmatch against existing and potential adversaries. TRADOC describes innovation in the Army Operation Concept as

the result of critical and creative thinking and the conversion of new ideas into valued outcomes. Innovation drives the development of new tools or methods that permit Army forces to anticipate future demands, stay ahead of determined enemies, and accomplish the mission. Innovation is particularly important in organizations that develop capabilities as well as those that train, equip, and sustain forces. (TRADOC, 2014, p. 22)

From this critical thinking, the Army determines the needed capabilities to equip the future forces. Such thinking also provides the answers to how tomorrow's leaders will employ future and existing capabilities to accomplish a multitude of missions in various environments (TRADOC, 2014). Formally, this critical thinking supports the Army's Warfighting Challenge No. 4:

How to maintain an agile institutional Army that ensures combat effectiveness of the total force, supports other services, fulfills DOD [Department of Defense] and other agencies' requirements, ensures quality of life for Soldiers and families, and possesses the capability to surge (mobilize) or expand (strategic reserve) the active Army. (TRADOC, 2014, p. 32).

Currently, the Army uses an acquisition process in which the capability developer conducts a needs analysis to determine if any gaps exist in the current and future forces capabilities needed to accomplish their required missions (TRADOC, 2014). If any gaps exist, the capability developers identify them and develop the requirements necessary to fill them. Then, they give these requirements to material developers to build the system and field it to the operational Army. This process utilizes very few capability developers and produces very few prototypes for testing. The Army could improve this process by increasing the number of critical thinkers participating in the design process, which in turn should also increase the number of viable prototypes for future testing. One way the Army seeks to leverage innovation and improve the acquisition process in this manner is to use Early Synthetic Prototyping. (ESP).

ESP is a new initiative from the Army Capabilities Integration Center (ARCIC) that seeks increase the amount of critical thinkers participating in the design of future capabilities with the use of an online military themed game. This game will allow users outside of the traditional capability and material development community to participate in the design process. ESP will allow Soldiers from across the Army to test and evaluate synthetic prototypes and then provide feedback to developers (Vogt, 2016). The Army will leverage innovation by crowdsourcing ideas and evaluations from thousands of Soldiers to ensure the Army of the Future maintains overmatch against its potential foes.

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II. BACKGROUND

The Army is looking to ESP to not only increase the number of viable prototypes, but also produce feedback from the actual users early in the design process. The main vehicle for this feedback will be the use of an online game and an online community. Therefore, the focus of this thesis concerns how to best facilitate feedback from players in a form useful to materiel developers. One of the most recent trends in online gaming is the creation and sharing of ideas using self-recorded game videos. Players of entertainment games often create videos of their game play to demonstrate how they solved a problem or completed a mission. These videos are then posted on public websites for sharing. If players are willing to create and share videos for commercial entertainment games, would ESP players similarly create videos in an ESP game environment?

A. EARLY SYNTHETIC PROTOTYPING

According to ARCIC,

initial research indicates that computer based gaming environments can provide a cost-effective and engaging means to enable Soldiers and leaders across the Army to explore future capabilities, develop solutions to associated challenges, provide related recommendations, and collaborate with one another to inform concept and capability developers. (Vogt, 2016, p. 1)

1. What Is ESP?

ESP is a new concept the United States Army is currently exploring. The two primary agencies conducting the research are ARCIC and the United States Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA[ALT]) (Richmond, n.d.). According to Vogt (2016), the Early Synthetic Prototyping Project Lead for ARCIC, the Army has divided the development of ESP into four areas of effort: collaboration, feedback and game analytics, the game environment, distribution and network capability, and research.

The largest effort in the development of ESP is the development of collaborative environment. The collaborative environment will provide “the means for Soldiers to provide explicit/qualitative feedback through surveys, polls, discussion boards as well as implicit/quantitative feedback through automated game analytic tools to identify trends in game play” (Vogt, 2016, p. 2). The next effort is the development of the game environment. Many military-based games are available within the Department of Defense (DOD) and as commercial-off-the-shelf solutions; however, since the goal of an ESP game is much different, most, if not all, of the other solutions available will not be suitable for an ESP game (2016). An ESP game will need to collect data unique to the acquisition and material development process. This will require the Army to build two types of games. The first game will be a first person shooter game. It will evaluate how Soldiers use and interact with individual systems. The second game will be a strategy game played at a higher echelon to evaluate organization and employment of future systems (2016). The third effort for the development of ESP is distribution and network capability. This effort focuses on the need “to deliver and host the game environment(s) and the feedback, collaboration and game analytic tools” (p. 2). Finally, the last effort is research. Since ESP is a new concept, the Army will need to collaborate with both industry and academic institutions to ensure that the body of knowledge with regard to ESP is continuously growing (2016).

ESP essentially seeks to improve not only the Army’s acquisition process but also doctrinal and organizational development processes by making two major changes to the current acquisition process. First, it seeks to increase the number of viable design points by using crowdsourcing to develop and evaluate virtual prototypes. Second, it aims to put the soldier in the middle of the design process. In its final state

ESP is envisioned to provide a synthetic game environment where engineers and concept developers can rapidly model multiple potential capabilities/prototypes. Soldiers, on and off duty, are able engage in various scenarios specifically designed to elicit feedback that address research questions associated with the Army Warfighting Challenges as it relates to doctrine, organization, and materiel solutions. (Vogt, 2016, p. 1)

Currently, the Army's system for material development does not include the Soldier until the testing phase of new equipment. This system allows for very little collaboration between all stakeholders involved in the acquisition process. Using ESP for development, ESP brings the Soldier to the center of the process and collaboration between all agencies is possible not only through the ESP collaboration environment, but also from the game metrics specifically designed to inform developers on the evaluation of proposed systems (see Figure 1).

Figure 1. Current Development System versus the ESP System. Source: Vogt, Darken, McGroarty, Smith, Perriello, and Phillips (2014).

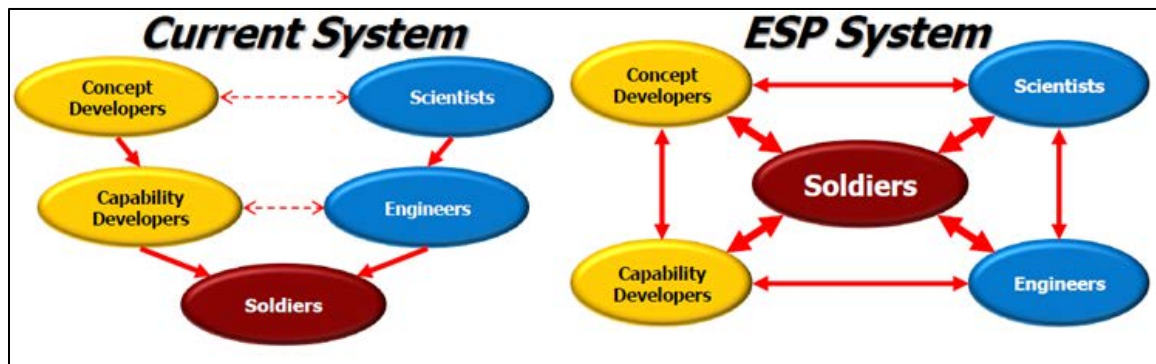
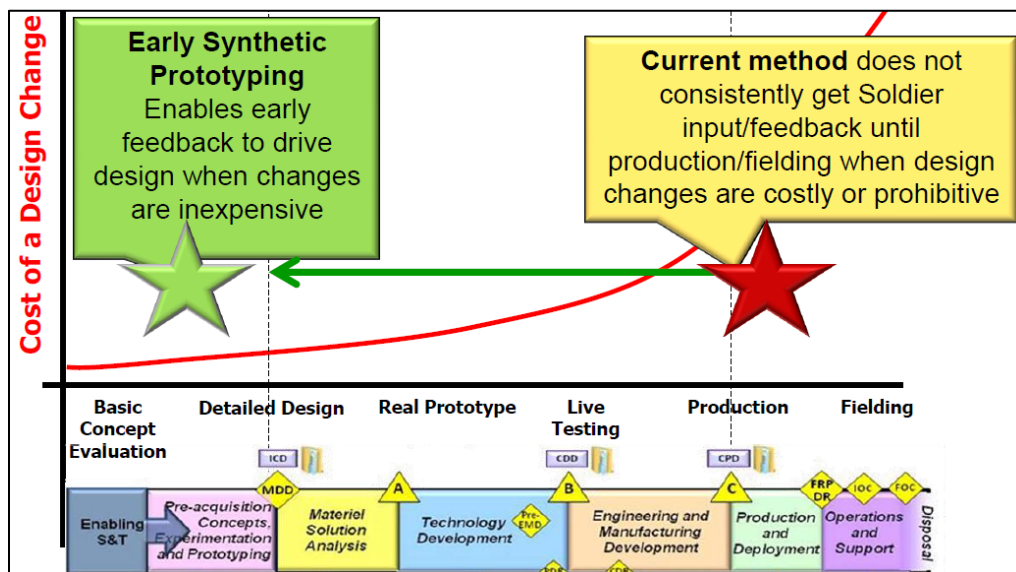


Figure 2. Cost of a Design Change. Source: Vogt et al. (2014).



Also, the current design method used by the Army does not gather feedback from actual users until late in the development timeline, when actual prototypes are available for testing (see Figure 2). This is expensive and limiting. ESP seeks to enable an environment in which soldiers can provide feedback based on virtual prototypes. Since these virtual prototypes are available much earlier in the development timeline, the changes are much cheaper. ESP seeks to bring “Soldiers, scientist, engineers and concept developers into a common environment to rapidly assess, modify, and experiment with future equipment—without bending a single piece of metal. The core objective of ESP is to transition ideas and concepts from a good idea on a dry erase board to the game environment that thousands of soldiers across the Army, on and off duty are able to assess. This assessment will simultaneously inform science technology investments as well as inform doctrine, organization and training/education development” (Vogt, 2013, p. 1).

2. Previous ESP Projects

The Office of Secretary of Defense (OSD) Engineered Resilient Systems sponsored the first ESP project in December 2013. This pilot study’s objective was to examine the feasibility of using gaming as a means to evaluate future capabilities. This study resulted in a thesis experiment conducted at the Naval Postgraduate School (Vogt, 2016). The study sought to answer the following questions: “What feedback can be gathered from [ESP] game play” and “Would that feedback be valuable” (Murray, 2014, p. xix). The results of the study concluded that information collected from game play in an ESP environment is both relevant and useful (Murray, 2014).

In December of 2014, the Army Modeling and Simulation Office (AMSO) sponsored another ESP study. In this study conducted by ARCIC, the researchers focused on two major questions. First, they wanted to find out what would motivate soldiers to play ESP games in their off time. Second, they sought to determine if any of the feedback and metrics collected from their pilot study were useful to capability and material developers. Results of the study indicated that a large majority of soldiers wanted to participate and play ESP games if they knew that the Army was using their feedback to

develop future weapon systems. Furthermore, the researchers also felt that the quality of the feedback received, although through surveys and discussions, was valuable (Vogt et al., 2015).

B. GAMING COMMUNITIES AND THE “LET’S PLAY” PHENOMENON

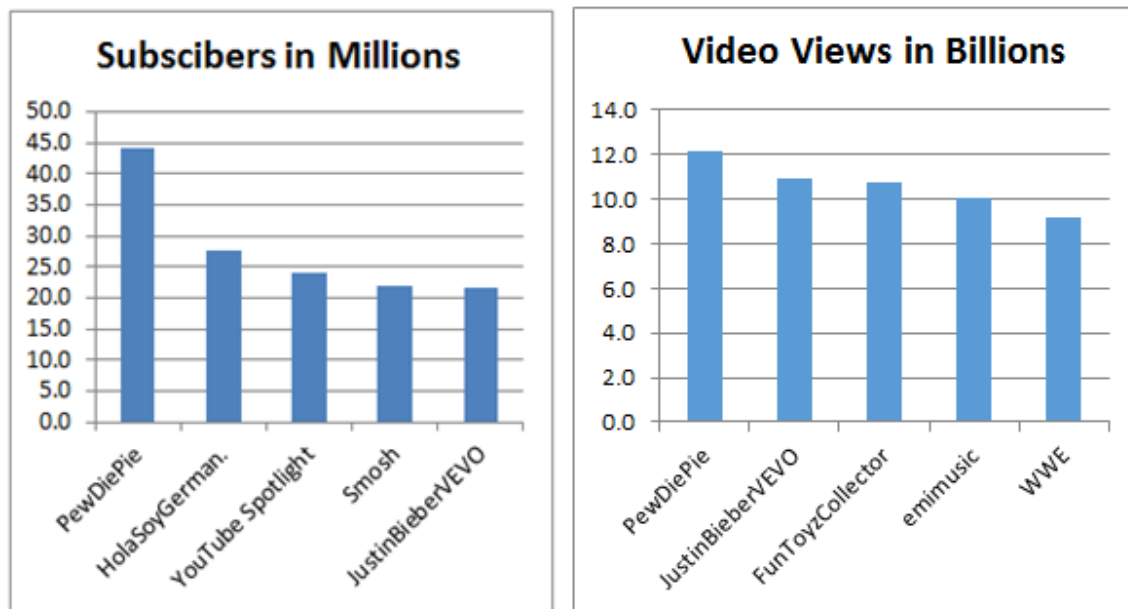
Video games are more popular now than ever and that means big business to the game industry. Over 155 million Americans play video games, more than half of the households in America have a dedicated game system, and total consumer spending on video games in the U.S. exceeded 20 Billion dollars in 2015 (Entertainment Software Association [ESA], 2015). Gaming numbers may be even higher for Soldiers. One recent study suggested that over 76 percent of the Army’s Soldiers who would participate in ESP games already play video games. Over 70 percent of these soldiers play at least two hours a week and over 50 percent of them play over ten hours (Vogt et al., 2015). Compare that with recent statistic from the ESA that only 42 percent of Americans play video games more than three hours per week (ESA, 2015). These statistics suggest not only that the average Soldier plays more video games than the average American, but also that the Army has a prime environment in which to create a community of ESP players.

Creation and management of a gaming community in which players will be able to connect with other players and developers are paramount to the success of the ESP program. These communities will be the environment in which players will both share their experiences and provide feedback. These communities will also allow developers to both actively and passively collect the desired metrics on the various prototypes tested. (Vogt, 2016)

While the ESP developers will seek to create and manage this online community, history has shown that most likely this community will take on a personality of its own. The emergence of gaming channels on YouTube is one such an example of players seeking an area to collaborate as well as watch other, more skillful players (Iannitti, 2015). While this may sound foreign to people who do not play games or identify as gamers, the numbers show that this phenomenon is becoming more and more

mainstream. The number one channel on YouTube in both subscribers and views (see Figure 3) is a 25-year -old gamer from Sweden named Felix Kjellberg, but goes by the screen name of PewDiePie (McConnell, 2014). Not only is Kjellberg No. 1 in terms of subscribers and video views, he is the No. 1 video creator on YouTube, earning over \$12 million in 2015 alone (Berg, 2015).

Figure 3. Top YouTube Video Views and Subscriber Channels. Adapted from SocialBlade (2016).



So, why do gamers flock to watch other gamers play video games? According to Nick Iannitti, Digital and Social Media Strategist at Fuel Entertainment, this behavior is nothing we have not seen before. Iannitti says that the gamers that are creating videos are “simply following the preexisting laws of nature in something called Emergent Behavior. We can observe emergent behavior in everything from ant colonies to the largest of cities. The premise of emergent behavior is that we are all connected through networks (both online & offline) and that we naturally self-organize across our networks to form higher levels of order” (Iannitti, 2015, para. 7). In essence, gamers are looking for other gamers who share their interests. Thanks to advances in technology and the emergence of the Internet and YouTube, these communities can now connect anywhere, at any time.

What exactly is a YouTube game channel like “Let’s Play” (LP)? Essentially, LP is an online forum where “folks play through a game, continually document their progress via photos or video, and add their own commentary to complete the package. This content is typically posted in message board threads, which draw in an enthusiastic audience that’s eager to discuss the game, contribute suggestions, and even concoct their own creative works directly related to the title in question. The result: a highly interactive community that’s created hundreds upon hundreds of hours of entertainment” (Mackey, 2011, para. 2). Mackey’s description of LP looks quite similar to LTC Vogt’s description of what an ESP game will provide. Vogt states that an ESP community will be “the means for Soldiers to provide explicit/qualitative feedback through surveys, polls, discussion boards as well as implicit/quantitative feedback through automated game analytic tools to identify trends in game play” (Vogt, 2016, p. 2). It makes sense that ESP developers need to be concerned that their players may seek other forums for collaboration, especially if the ESP developers can produce an ESP game that is near the fun level of other commercial games that ESP developers will be competing with for Soldiers’ time. The issue of ESP game players collaborating outside of the ESP community could mean a loss of valuable game metrics if the information that users share in these types of forums is useful to both developers.

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III. METHODOLOGY, RESULTS AND DISCUSSION

A human-in-the-loop experiment which was approved the NPS Institutional Review Board, protocol number NPS20160038.0 was conducted at the Naval Postgraduate School (NPS) Modeling, Virtual Environments and Simulations (MOVES) Institute. The experiment was a case study to determine how effective self-recorded AAR videos of users playing ESP games are in the collection of feedback and the usefulness of the information gained to developers. The experiment utilized the Army's Virtual Battlespace 3 (VBS3) game to simulate an ESP-like game. VBS3 is a simulation training solution develop by Bohemia Interactive and used by the United States Army for collective training and mission rehearsals (Bohemia Interactive Simulations, n.d.). Researchers chose VBS3 as the software for this experiment to simulate an ESP game because it was readily available and flexible enough to create an adequate scenario for video creation and narration.

A. SCOPE

The scope of this thesis will be limited to analyzing the use and effects of video AARs in ESP game play systems. Information derived from ESP games for design and development purposes can run the gamut, and therefore other collection techniques will not be considered. Also, creation and management of the online game community itself would be a very difficult task; therefore, this thesis will assume that of such a community already exists. A surrogate will be provided locally.

B. EXPERIMENT DESIGN

The experiment utilized two groups of participants. Researchers recruited participants for both groups and randomly assigned participants to either to Group 1 or Group 2.

1. Participants

The experiment required 40 participants and took place over 10 sessions with four participants per session. Researchers solicited participants via flyer's distributed in

person and via the NPS muster page daily announcements. The target audience for the experiment was NPS students with military experience who regularly play video games. However, due to volunteer turn out, experimenters accepted participation from all respondents.

Participants formed two teams, either red or blue. For each session, during the initial in brief and introduction, the researcher queried all four participants to determine which players had the most video game experience. Based on that knowledge, the experimenter divided the participants to balance the teams with regard to game experience. However, it should be noted that team balance is not a key issue here since “performance” itself was not measured. Our interest here was in behavior and strategy employed, not in how well the team played the scenario.

The target audience for this study was military gamers; however, a few factors limited the ability to ensure that each participant was the ideal volunteer. First, the time constraints forced researchers to conduct the study over a three-week period. Second, this study required each session to have four volunteers. These two requirements made it difficult to find enough target volunteers with similar schedule availability to conduct the experiments. See Table 1 for participant demographics.

Table 1. Participant Demographics

Participant Demographics

Age					
Group 1					
20-24	25-29	30-34	35-39	40-44	45-49
1	2	7	8	1	1
Group 2					
	25-29	30-34	35-39	40-44	45-49
	6	5	3	5	1
Total					
20-24	25-29	30-34	35-39	40-44	45-49
1	8	12	11	6	2

Sex	
Group 1	
Male	Female
16	4
Group 2	
Male	Female
19	1
Total	
Male	Female
35	5

Military Branch/Nationality							
Group 1							
US Army	US Navy	USMC	Turkish Army	Turkish Airforce			
3	8	7	1	1			
Group 2							
US Army	US Navy	USMC	Turkish Army		Turkish Navy	US Civ	
5	4	5	1		2	3	
Total							
US Army	US Navy	USMC	Turkish Army	Turkish Airforce	Turkish Navy	US Civ	
8	12	12	2	1	2	3	

Grade				
Group 1				
O1	O2	O3	O4	O5
1	2	8	7	2
Group 2				
O1	O2	O3	O4	O5
0	2	7	7	1
Total				
O1	O2	O3	O4	O5
1	4	15	14	3

Years of Military Service				
Group 1				
0-4	5-8	9-12	13-16	16+
2	6	4	7	1
Group 2				
0-4	5-8	9-12	13-16	16+
0	7	3	3	4
Total				
0-4	5-8	9-12	13-16	16+
2	13	7	10	5

Game Consoles Owned				
Group 1				
0	1	2	3	3+
10	6	3	1	0
Group 2				
0	1	2	3	3+
5	7	4	3	1
Total				
0	1	2	3	3+
15	13	7	4	1

Hours/Week Playing Games				
Group 1				
0	0-2	2-4	4-10	10+
4	5	6	2	3
Group 2				
0	0-2	2-4	4-10	10+
13	3	1	2	1
Total				
0	0-2	2-4	4-10	10+
17	8	7	4	4

2. Scenario Design

The scenario for each session was the same. The red team occupied an abandoned prison and held an American journalist hostage. The red team's mission was to protect the hostage and defend their position until a red quick reaction force (QRF) could arrive. The red QRF would arrive 8–10 minutes after either the initial engagement or when red forces spotted blue forces. The blue team's mission was to move from their release point to the prison, secure the prisoner, and then move to the pick zone (PZ) for extraction.

The red team consisted of four opposing forces (OPFOR) soldiers. Two red participants played two of the four soldiers, and the game's artificial intelligence (AI) controlled the other two. The red team could place the two AI soldiers in either the towers to provide overwatch of the prison or as roving guards to patrol the perimeter of the prison complex. The red team would win if they either defeated the blue force attack or prevented the blue forces from securing the prisoner until their QRF arrived.

The blue team consisted of four U.S. Army Soldiers. Two blue participants played two of the four soldiers and the game's AI controlled the other two. The blue force

commander, however, did have the ability to control the AI soldiers by using the commands within the game. The blue team won the game if they successfully secured the prisoner and reached the PZ before red QRF forces arrived.

3. Group 1 Experiment

For Group 1, participants began by completing a few tutorials and a practice scenario. The tutorials taught the users basic movements and game functions needed for the game scenario. After the tutorials, users conducted a rehearsal scenario where they had the opportunity to practice the execution of the various controls needed to complete the mission. After the rehearsal scenario, the moderator gave each team a mission brief.

After this brief, each team had 5 minutes to plan their mission. The blue team had to choose one of three possible release points where they would begin their mission. The red team had to choose one of two defense strategies, either roving guards or towers.

Once the game was complete, the experiment moderators assisted each user in the creation of an AAR video. This video used actual game play footage and a planning map overview for the users to narrate and analyze their execution of the mission and the decisions they made.

The following questions were used to guide the red team participants in creating their AAR video. All questions were not answered in all videos, but this was intended to ensure that each video contained similar information that would be relevant to a subsequent player.

1. Why did you pick your defense course of action (COA) (rovers versus guards)?
2. What was your planned scheme of maneuver for defense?
3. Did anything prevent you from executing your planned mission?
4. Was your mission a success? Why or why not?
5. What if anything would you do different?

Similarly, the blue team videos addressed the following questions:

1. Why did you pick your release point?
2. What was your planned scheme of maneuver?
3. Did anything prevent you from getting to the objective, if so what?
4. What happened at the objective?
5. Was your mission a success? Why or why not?
6. What if anything would you do different?

Participants also filled out a short demographic survey as well as post task survey.

Once Group 1 completed recording all 20 videos, the researchers reviewed and ranked the videos based on both content and presentation. This was an artificial ranking but it is what players would expect from an actual community site that would rank videos based on viewer feedback. Since this study did not have an actual online community to rank the videos, there needed to be a way to present the videos to the second group along with some feedback about which were the best ones. In practice, players would expect a game-based social network where users give “likes” and add comments to the best videos and the best videos will have the most “views.” The rankings were important and they ensured that the videos the second group viewed were the most engaging. For this experiment, the actual ranking of AAR videos is not important because our focus was on the affect the videos had on subsequent players who viewed the videos.

Once all the videos had been ranked, the top two from both the blue and red sides were chosen for the test group to watch. However, further analysis of the videos after ranking revealed that all of the red videos utilized the red defense of guard towers, and none of the blue videos utilized the strategy of starting at release point 2. Since the goal of the experiment was to see if the Group 1 videos affected the behavior of Group 2 (the dependent group), researchers created two artificial videos to add to the set of videos for Group 2 to view. One video was a scenario in which the red forces would use a roving guard strategy. The other video was a scenario in which the blue forces would start out

from release point 2. With a set of AAR videos covering the full breadth of strategic options, the study could determine if the additional information caused players in Group 2 to differ from their decisions in both mission planning and during the operation.

4. Group 2 Experiment

Researchers solicited and organized Group 2 in the same manner as Group 1. In addition, moderators screened users to ensure that no one who participated in the first group participated in the second group. After the formation of teams, moderators gave Group 2 the same opportunities and time as Group 1 to complete tutorials and a practice scenario. After familiarization, the moderators administered the exact same mission brief to Group 2 that they gave to Group 1. After this brief, the moderators allowed Group 2 to watch about 15 minutes of three short AAR videos from Group 1 completing and narrating their missions. After watching the videos, moderators gave Group 2 the same planning time as Group 1 before starting the mission.

At the end of their mission, the second group completed a short survey about their experience. The questions in their survey included the following:

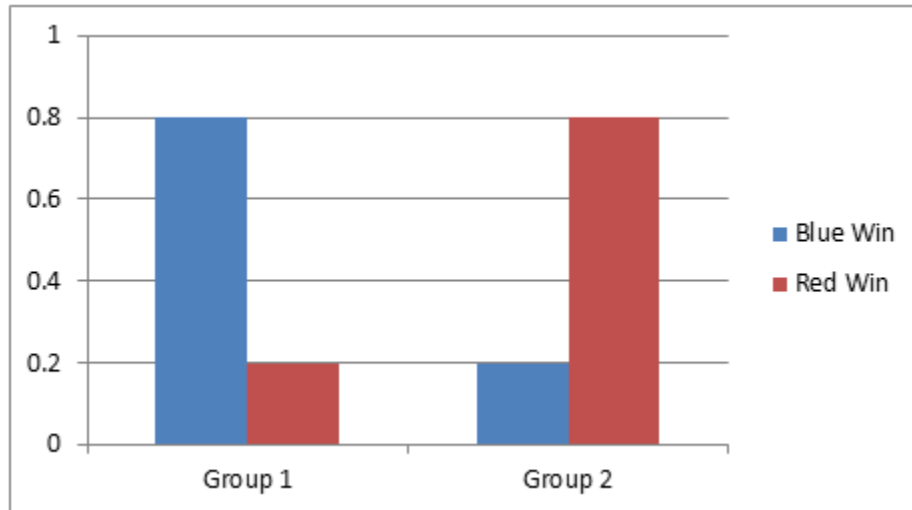
1. How much did the videos influence your decisions in either mission planning or during the operation?
2. How useful did you think the videos were and would you recommend that other users watch them?
3. How much did the videos contribute to your overall success or failure in completing the mission?

C. RESULTS

The first metric collected from each scenario was mission success. Blue teams succeeded in the mission if they could get the hostage from the prison complex to the PZ for extraction. Red teams succeed if they prevented the hostage and blue forces from getting to the PZ. Moderators briefed both sides that if either team harms the hostage, that team would lose; however, this never happened during the experiment. The results of

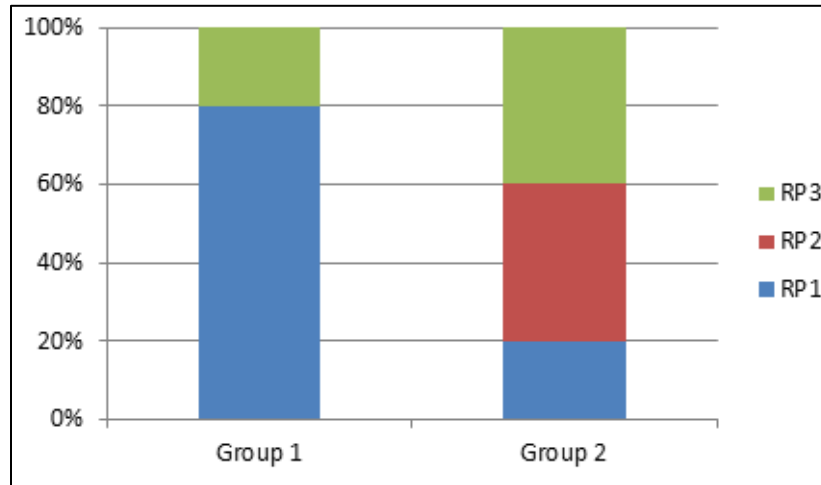
Group 1 produced four blue winning sessions and one red winning session, and Group 2 produced four red winning sessions and one blue winning session (see Figure 4).

Figure 4. Blue versus Red Winners by Group.



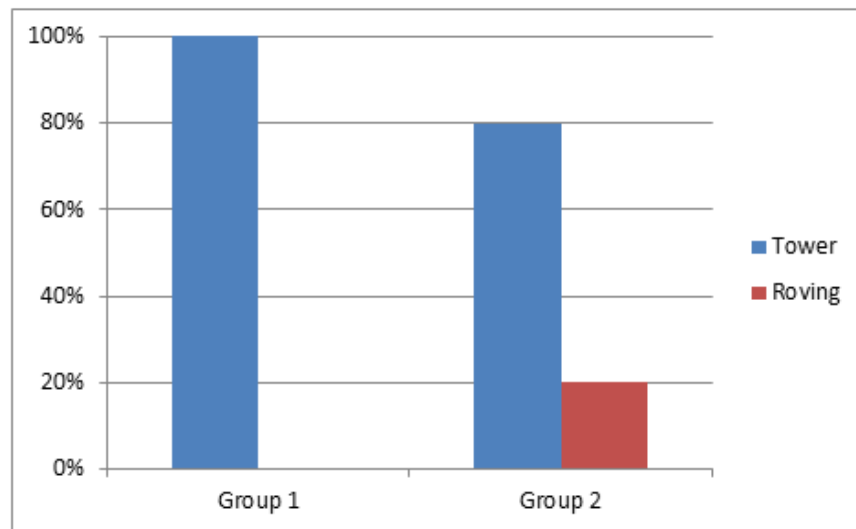
In the scenario, the blue forces had to choose either release point 1, 2 or 3. In the first group, blue players chose release point 1 four times and only choose release point 3 once. Group 1 blue forces never selected release point 2. Group 2 only selected release point 1 once and selected release point 2 and 3 twice each (see Figure 5). In discussion with the Group 1 players after the session, all of the players that chose release point 1 did so because they felt it offered the most cover and concealment.

Figure 5. Blue versus Red Winners by Group.



The red team had the option to choose one of two defense strategies. The two options were defending with two AI soldiers positioned in guard towers or two AI soldiers assigned roving guard routes. Group 1 only chose the guard tower option and Group 2 chose the guard tower option all but once. In discussion with the red teams that chose the guard tower option, all stated that the reason was to give them advanced notice of blue forces arriving (see Figure 6).

Figure 6. Red Team Strategy—Tower versus Rover.



After each mission, moderators gave all participants post task surveys to fill out. The post task surveys only contained three questions that common for both groups:

1. On a scale of 1–5 (1 being “bad” and 5 being “great”) How would you rate your game experience?
2. On a scale of 1–5 (1 being “not fun” and 5 being “fun”) How would you rate how fun the game was?
3. Would you create videos for other players to watch? Yes/No

The average score for game experience for Group 1 was 3.7, and the average score for Group 2 was 4.1. The average score for how fun the game was for Group 1 was 3.8 and the average score for Group 2 was 4.5 (see Figure 7). The game experience means between Group 1 and Group 2 did not have any significant statistically difference (see Figure 9). However, there was a statistically significant difference between Group 1 and Group 2 with regard to the mean scores on questions two. Analysis showed that at a 95 percent confidence level, the amount of fun that Group 2 recorded was higher than what Group 1 had (see Figure 8).

Figure 7. Blue versus Red Winners by Group.

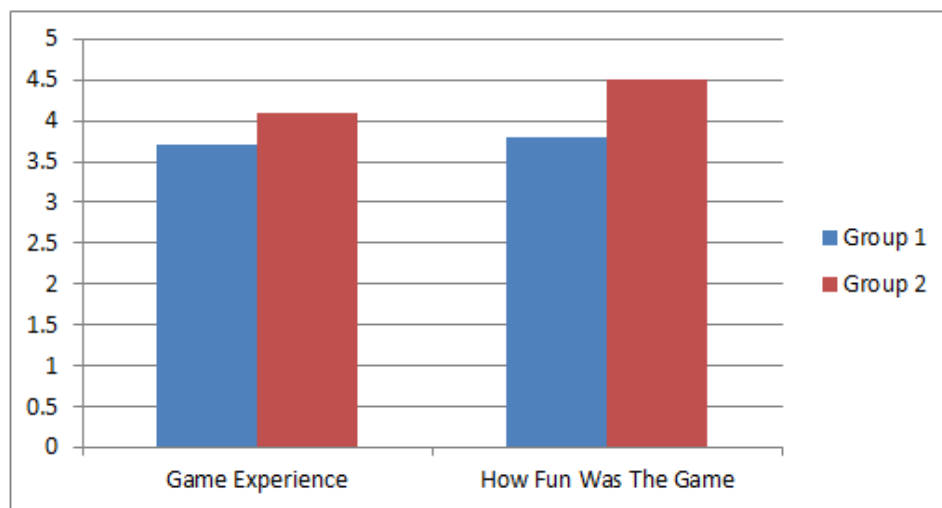


Figure 8. Analysis of Means for Question 2—Rate Your Game Experience.

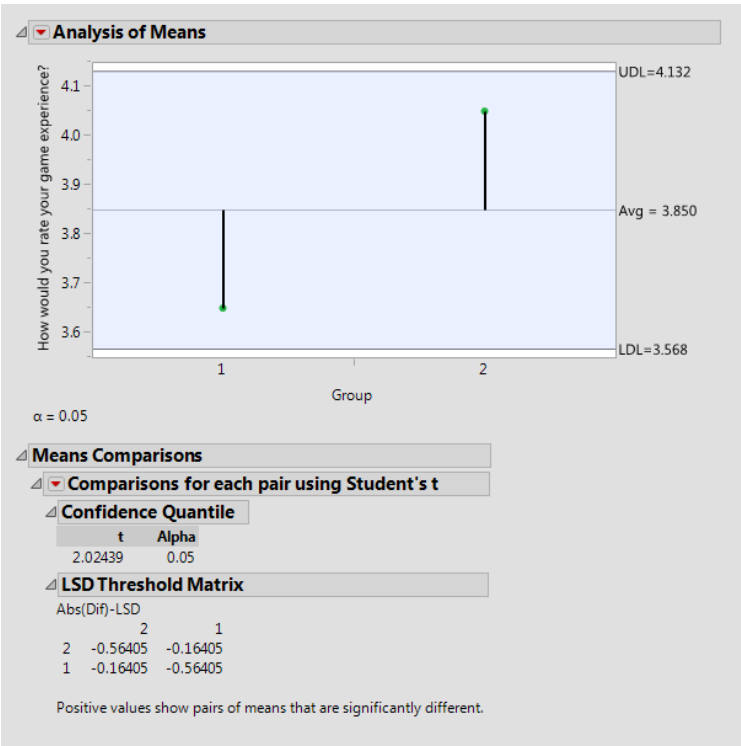
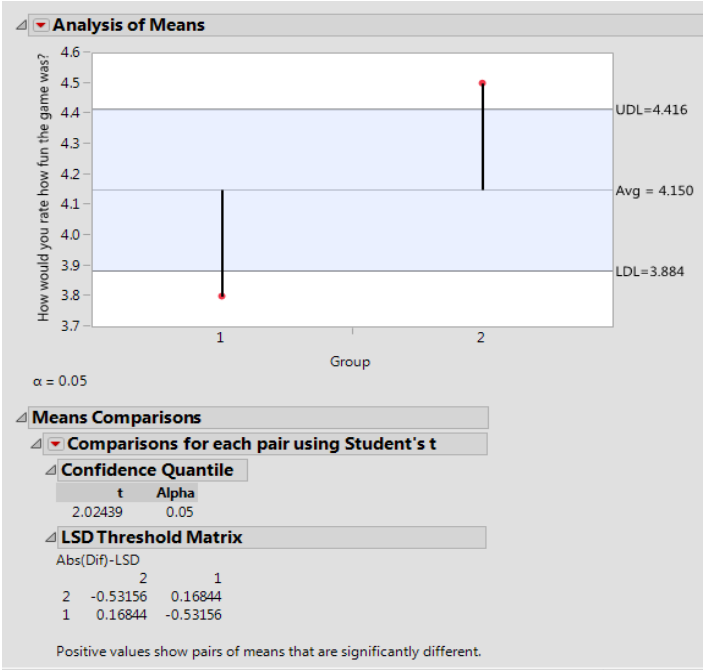


Figure 9. Analysis of Means for Question 2—Rate How Fun the Game Was.



Analysis of Question 3 revealed that about in total 72.5 percent of the participants said that they would create videos for others to watch. Group 1 participants answered yes 75 percent and Group 2 answered yes 70 percent. There was no statistical difference in the two groups scores (see Figures 10 and 11).

Figure 10. Mosaic Plot—Would You Create Videos? By Group.

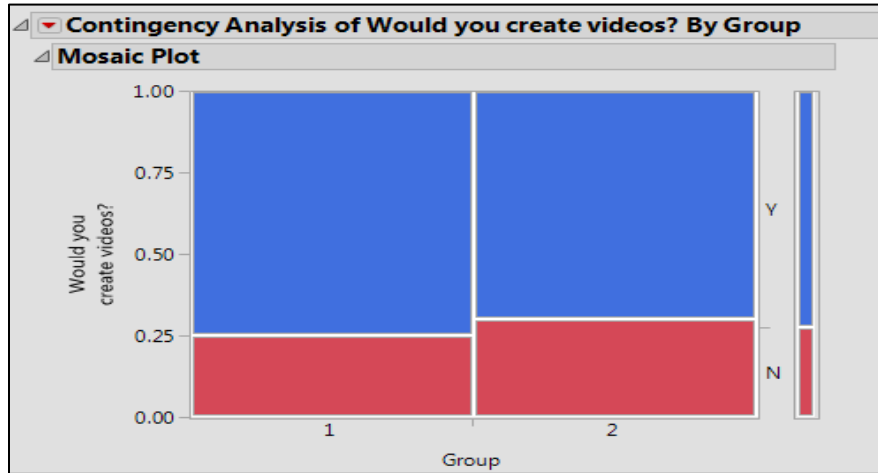
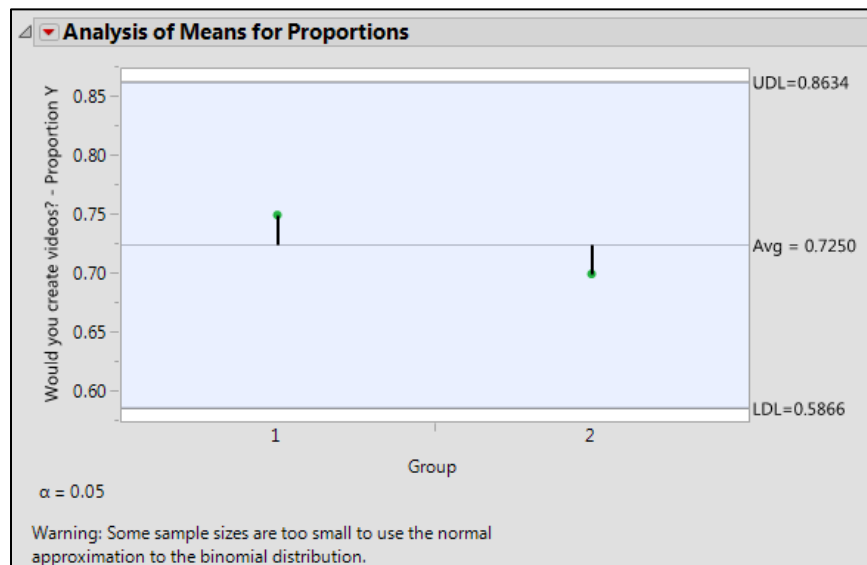


Figure 11. Analysis of Means for Proportions—Would You Create Videos?

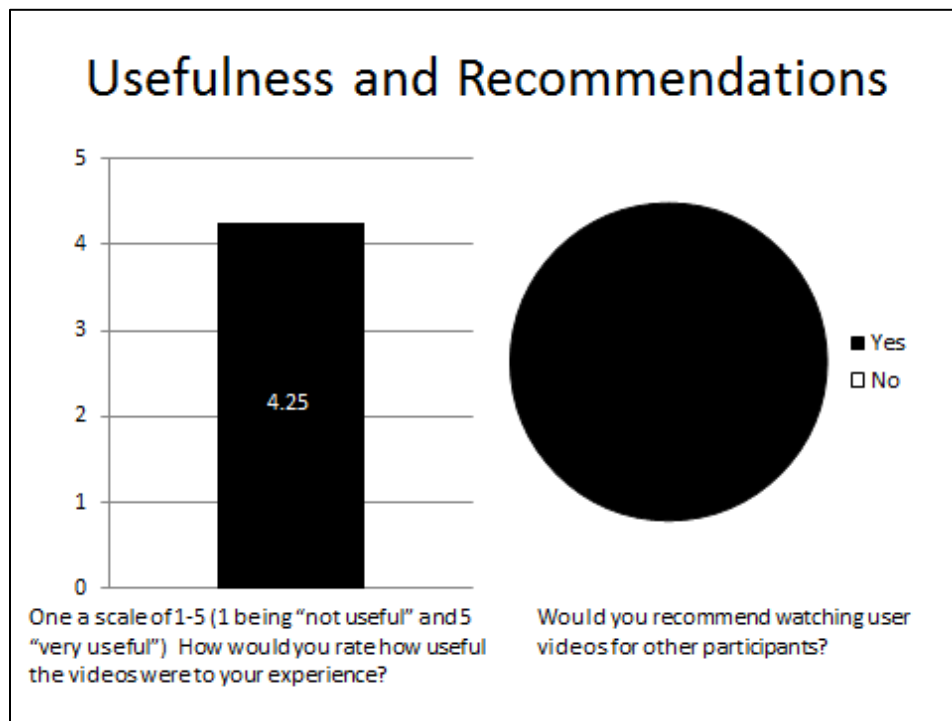


Group 2's survey asked the Group 2 participants eight additional questions that related directly to the videos that they watched before playing their session. The questions were:

1. On a scale of 1–5 (1 being “not useful” and 5 “very useful”) How would you rate how useful the videos were to your experience?
2. Would you recommend watching user videos for other participants? Yes/No
3. Do you feel that the user videos influenced your decisions during mission planning? Yes/No
4. If yes, rate the influence on a scale of 1–5 (1 being “little influence” and 5 “highly influenced”)
5. Do you feel that the user videos influenced your decisions during the operation? Yes/No
6. If yes, rate the influence on a scale of 1–5 (1 being “little influence” and 5 “highly influenced”)
7. Do you feel that the user videos contributed to your success or failure of the operation? Yes/No
8. If yes, rate the contribution on a scale of 1–5 (1 being “little contribution” and 5 “high contribution”)

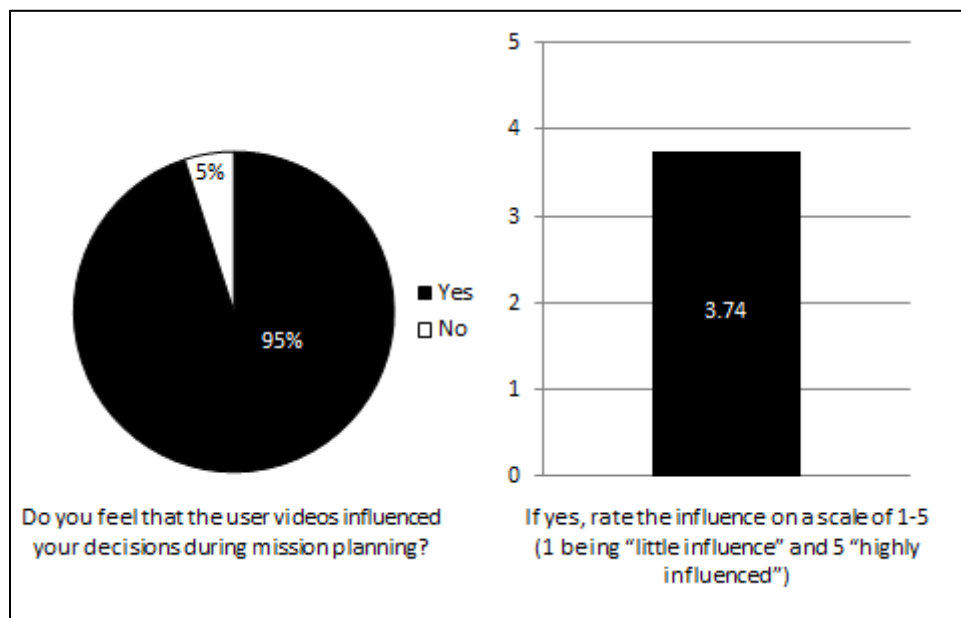
On a scale of 1–5, Group 2 rated the videos as a 4.25 in terms of helpfulness and 100 percent of the participants said that they would recommend to other players to watch the videos (see Figure 12).

Figure 12. Usefulness of Videos and Would You Recommend Them.



Ninety-five percent of Group 2 participants said that the videos affected their mission planning and rated the effect on mission planning as 3.74 (see Figure 13).

Figure 13. Effects of Videos on Mission Planning.



In contrast, only 55 percent of Group 2 participants said that the videos affected their decision during the mission. Those who said it did rated the effects as 3.74 out of 5. (see Figure 14). The effects on mission planning versus decisions during the operation showed that the videos affected Group 2 participants during mission planning 40 percent more than they affected decision during the operation. The score with regard to how much the video affected both were very similar (see Figure 15).

Figure 14. Effects of Videos during the Operation.

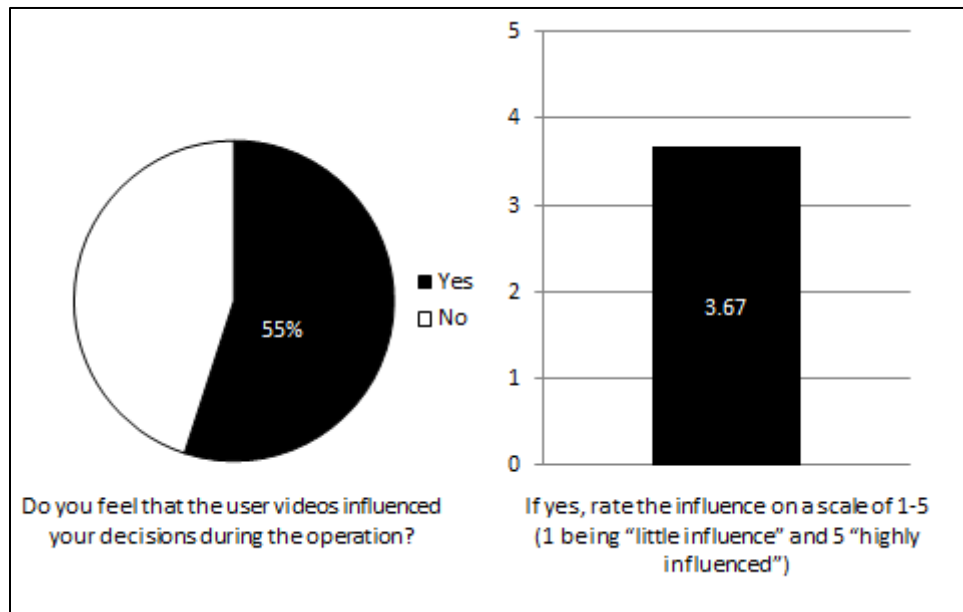
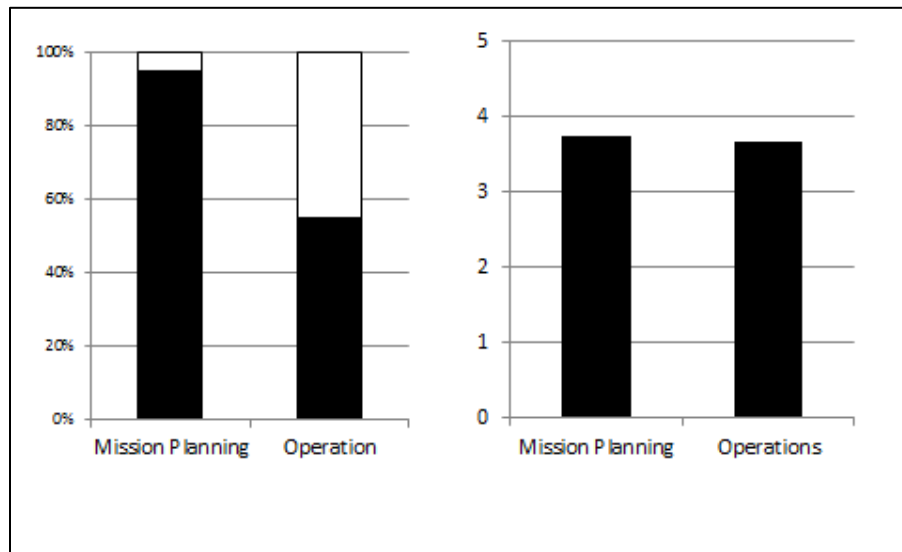


Figure 15. Effects of Videos during Mission Planning versus the Operation.



D. DISCUSSION

1. Artificial Online Community

Creating an actual online community of ESP game players to conduct this study was outside of this study's scope and resources. Therefore, Group 1's primary purpose in this study was to provide the video narration for the researchers to use to create an artificial online community. This artificial online community would be the environment for the second group to play in. In a real online community, users would rank and score videos based on their content and usefulness, and it would be easy for the other users to find the best and most watched videos. Given the time constraint for the experiment, Group 2 did not have the necessary time to watch all ten full-length videos created by Group 1. Therefore, the researchers needed to choose the best videos and then edit each video selected from roughly 15 minutes to 3–5 minutes. This was done by speeding up the playback of the video in between the voice narration parts of the video.

However, Group 1 had a secondary role in this experiment. Because they did not receive any AAR preview prior to executing the missions, their strategic and tactical decisions were used as a baseline for how players might approach the scenario without

any opportunity to see how others attempted it before them. See Section 5 for further discussion on this point.

Another issue that creating an artificial online community presented was the lack of variety in videos created by Group 1. Group 1 conducted five separate sessions in total and in those five sessions, the Group 1 blue team selected release point 1 for its starting point 4 times and release point 3 only once. Not one Group 1 team selected release point 2 as a starting position. The Group 1 red teams followed suit and selected the tower defense strategy over the roving guard strategy each time as well. After the Group 1 session, the selection of videos chosen for Group 2 to watch did not have any release point 1 or roving guard strategies examples for Group 2 to watch. In order to present Group 2 with a variety of videos, two artificial videos were made, one to illustrate an example of release point 2 and one to illustrate an example of defending with roving guards. Due to the small sample size for video selection coupled with the fact that the primary focus for Group 2 was how they would react to the videos, adding two artificial videos was a change that the researchers felt was warranted.

One outcome from presenting Group 2 with a variety of videos that showed multiple ways to complete the mission was the Group 2 blue forces and red forces showed more variability in their strategy selection than Group 1. However, due to such a small sample size of videos and sessions, this data cannot support any conclusions without additional research.

2. Winning Percentage—Group 1 versus Group 2

The blue team would win the scenario if it successfully moved the hostage to the PZ before the red team's QRF arrived. For the red team, preventing the blue forces from reaching the PZ with the hostage and ensuring the safety of the hostage constituted a successful mission. Group 1 produced four out of five blue winners. Group 1's blue team used release point 1 three times successfully and release point 3 once successfully. In the second group of trials, the blue force was only successful once. The lone successful run from blue forces in the second group originated at release point 2 and was against a red force utilizing the towers. In the other four sessions in Group 2, the Group 2 red teams

won each time. The major difference between the red forces in Group 1 and Group 2 was the use of a heavy machine gun inside the prison. This was a strategy that was highlighted in one of the videos and all of the red teams in Group 2 adapted to this strategy. The adoption of this strategy was primary responsible for the shift in red's winning percentage from 20 percent to 80 percent, thus providing further evidence that the AARs did affect subsequent player strategy and behavior.

Blue forces may have redistributed their starting points due to watching the videos, changing from starting at release point 1 four times and release point 2 once, to starting at release point 1 once, release point 2 and 3 twice each. Anecdotal evidence revealed that most Group 1 blue forces chose release point 1 because they felt it offered the most cover and concealment. Group 2's blue forces, however were able to watch two successful videos in which the cover and concealment afforded to the blue forces from release point 1 did not outweigh the easier access to the objective that release point 2 and release point 3 offered. In fact, even though the blue forces were less successful in the second group, it was not due to the release point that they selected. In Group 2, blue forces reached the prison complex in all of the scenarios with more combat power than they did in Group 1. As stated earlier, the biggest reason for the shift was due to Group 2's red forces use of a heavy machine gun at the objective. Group 2's blue forces also utilized successful examples they viewed from Group 1's videos such as use of an AT4 rocket launcher on the guard towers and utilization of easier access points in and out of the objective.

3. Increase in "Fun" Level for Group 2

As stated earlier, Group 2 reported a statistically significant difference in the level of fun that it had compared to what Group 1 reported. The data collected from this experiment does not point to any underlying reasons for this shift; however, future experiments should examine a few hypotheses. First, it may be that playing the game after you have seen others play creates more of a competitive game environment. Second, it could be that after the Group 2 players saw their peers from Group 1 complete the mission successfully and report how they did it, it gave more incentive for Group 2

players to not only complete the mission as well, but do even better than the previous group. Another reason may be that watching videos gave Group 2 more context about the mission and highlighted more options that Group 1 was not able to fully see. This added information and context may have made the game more fun for Group 2. Finally, the reason for the difference in the fun levels between the two groups could be that creating the videos was less fun than watching them. Since Group 1 had to create the videos, they recorded lower fun levels than the group who did not have to create them. Although it is unlikely that the video creation decreased Group 1's fun level significantly since both Group 1 and Group 2 recorded very similar game experience scores, the effects of creating videos on the fun level cannot be ruled out.

4. Usefulness of Videos

Group 2 unanimously responded that it would recommend watching the videos to other participants. This number is hard to ignore and evidence shows both qualitatively and quantitatively that watching the videos made Group 2 better at completing the mission than Group 1. Compare this number with the fact that 95percent of Group 2's players said the video affected mission planning; one can easily infer that Group 2 feels that other users should use these videos for their mission planning as well.

Furthermore, if the AAR videos were useful to Group 2 players in exploring options and making decisions about how to execute the mission, then it also suggests that an analyst (e.g., acquisition, operations) would also be able to extract the same useful information from the AAR videos. This implies that when an analyst designs an ESP scenario to answer a specific question, he must ensure that the scenario forces the game player to solve a problem exactly on that point so that it will be addressed in the resulting AAR video.

5. Effects on Mission Planning Decisions versus Operational Decisions

Ninety-five percent of Group 2's players responded that the videos affected their mission planning while only 55percent said it affected their actual decision during the game. The difference in these proportions suggests that while the Group 2 players used other players' experience for planning, once the mission began, what they saw and

learned was not as valuable as the information gathered as the mission unfolded. This is understandable since the mission they completed was against other human players and therefore, the videos could not predict exactly what the Group 2 players would face. It also suggests that during mission planning, it is easier to consider other players' opinions, but once the game begins, the players are now in reactionary mode, without time to consider the videos. It may also suggest that the AARs were especially effective in planning such that operational decisions went generally according to expectations thereby requiring little input from the AARs. In either case, we are encouraged that the AARs were indeed useful and did provide valuable assistance.

6. Research Questions

The experiment in this thesis answered three of the four research questions proposed with quantifiable data. Researchers relied on qualitative evidence collected from the Group 1 videos to answer the one question not supported by quantifiable data collected from surveys or game play.

a. Is It Reasonable to Expect ESP Game Players to Create and Narrate Game Play Video AARs?

Survey data suggest that a large majority of players who participated in the study would create and narrate game play videos. Overall 72.5 percent of the participants said that they would. Although the sample size is too small to reasonably predict how many ESP players would actually produce videos, the results suggest that a good portion would.

b. Does Availability of Game Play Video AARs Increase User Feedback and Participation in ESP Game Play?

The study did not directly reveal whether the use of game play video AARs would increase participation. However, results did show that the players who watched videos had more fun than those that did not. This data coupled with the results from the study at Fort Bliss where soldiers indicated that the fun level was the most important factor for their participation in an ESP game (Vogt et al. 2015). If this data holds true, then one can infer that the use of videos would increase participation.

The videos also increased the feedback from the soldiers by providing the “why” in their decision. Most of what was collected from the players during their ESP game session was data that answered “what.” The game was able to determine what tactical decision and force structures the players made, but did not tell why they made them. The only way to get the answer as to why the players made certain decision was to watch the AAR videos. The videos alone provided the context for the various decisions that players made during the game.

c. Will Game Play Video AARs Provide Any Useful Feedback to Developers?

The main purposed of the videos is to capture the context around certain decisions made rather than act as a mechanism to capture large amounts of metrics for developers. It would be very difficult for developers gather data automatically from the videos. However, it may be possible for developers dive into the most watched or best-rated videos or videos from the users with the highest score to learn why they are making certain decisions. As mentioned earlier, if scenario designers create problems in their scenarios that directly address the questions they want players to answer, then the AARs will contain information about solving that problem that are useful to the developer. Guidelines for how to design scenarios to answer a specific question could be a fruitful topic of further research. This thesis shows that AARs would be an effective way to capture the necessary data that answers the question.

d. Will Game Play Video AARs Provide Any Useful Information to Other Players and Enhance Their Game Play?

The information present in the videos did provide useful information for the other players and made the game more fun for the players that watched the videos. Every player that watched videos said that they would recommend other users watch the videos as well. In addition, of the participants that watched videos, 95 percent said that the videos affected their mission planning and 55 percent said it affected their in game decisions. Additionally, players that watched the videos recorded a statistically higher level of fun than the players that played without watching the videos beforehand.

IV. CONCLUSIONS AND RECOMMENDATIONS

Although this study had limitations, it was an overall success. It produced a number of takeaways that should be of use to the ESP community. The limitations in this study could be easily overcome or mitigated in future studies, especially if future studies increase their scope and resources.

A. LIMITATIONS

This study had three main limitations that future studies should seek to overcome or mitigate. They were the lack of an actual ESP type game, a small sample size, and the lack of an actual online gaming community.

1. VBS3

While VBS3 was useful for this study, it has its limitations. First, VBS3 is a simulation training software designed to train soldiers in collective tasks at the platoon and squad level. VBS3 is not a feasible solution for an ESP game because the models in VBS3 are not easily changeable. An ESP game will need to offer the players a system with changeable design points so that researchers can evaluate the use of the system from various configurations as well as its use in various ways. VBS3 may have some limited capability to do some configuration changes, but given the resources available for this study, we were not able to utilize VBS3 in that manner. In fact, the game only presented organizational and tactical options to the players.

Another limitation in VBS3 is the functionality of the AI. The scenario from the experiment required game AI to control some of the forces. Although the researchers tested the game scenario through many rehearsals and trial runs with the game's AI, it was impossible to present the AI with every situation possible. Throughout both groups, situations arose where the AI did not act in the manner that the players would expect. For this reason, the players were informed which team members were AI and which were human-in-the-loop. This allowed moderators to manage the players' expectations since the players did not expect the AI to be as responsive as human teammates.

2. Sample Size and Participant Demographics

The amount of time available for this study coupled with resources available did not allow for a large sample size. Although 40 individuals participated in the experiment, only five sessions were run in each group. This gave a large sample size of participants, but a small sample size of sessions and videos to present to the second group. Another limitation in the sample size was the number of “gamers” in each group. While the moderators sought to balance the teams by how much time each participant regularly played video games, ideally the target audience for this type of test should be individuals who regularly play video games. When the Army fully develops ESP, soldiers will most likely play it on a voluntary basis (Vogt et al. 2015). For this reason, future studies need to measure the effects of videos on ESP players who are likely to play ESP games.

3. Artificiality of the ESP Community

The main effort of ESP will be the creation and management of an online community for players to collaborate and developers to harvest desired metrics (Vogt, 2016). In this environment, players will most likely create and share videos. Resources did not allow for the actual creation of such an environment. In addition, in an ESP environment, players who make and share videos will most likely create them on their own. In this study, moderators had to walk players through the creation of the videos and then edit the videos down so that the second group could watch a variety of videos in the time allotted.

B. RECOMMENDATIONS

As stated earlier, this pilot study provides a baseline for future studies. Additionally, it is recommended that future ESP games and communities be designed to allow ESP game players to create and share game play videos as well as communicate via chat room and message boards to exchange ideas. While the underlying reasons for the increase in fun from the videos are still unknown, the data supports the assumption that when players play after watching the videos, they have more fun. Since an ESP game will already need a collaborative environment for game players to share information with capability and material developers anyway, ESP developers should also include an

environment where players can communicate with one another as well. This would not only allow players to solicit ideas from each other, but also allow developers to investigate why players are making the design or usage decisions they are making. Additionally, future studies should seek to determine exactly what the underlying reasons for the increase in fun from the game play videos was. Two reasons that should be explored are (1) game play videos provide more context, and (2) game play videos create higher completion rates.

C. CONCLUSIONS

Although this pilot study had some limitations, it provided four key takeaways for future ESP studies and ESP developers. First, results suggest that incorporating user videos into an ESP community would increase participation as well as increase the fun of the game. Second, the data from this experiment indicates that the videos did in fact affect the players' behaviors. Third, every player who watched the videos recommended that other users watch the videos as well. Finally, over 70 percent of the participants responded that they would create and narrate videos in an ESP game environment.

The four key findings from the experiment together answer three of the four research questions this thesis set out to answer. The lone question that did not have any quantifiable data was did the videos provide any useful feedback for developers? This question was harder to qualify because the game used in this study was not an actual ESP game, and the players who created the videos followed a script to ensure that all of the relevant parts of the mission were covered. However, the data that the users presented did provide context for the decisions that the players made. Therefore, the videos would not provide the "what" to the developers; instead, they would provide the "why" to them. This would allow developers to understand the logic behind why players made decisions.

Although this was a pilot study, the results suggest that there may be some positive outcomes to incorporating a video sharing function into the ESP game community. In a previous study, researchers found that the number one reason soldiers would participate in an ESP game during their time off was fun (Vogt et al., 2015). Therefore, if Soldiers are playing in an environment where they can watch videos, this

should increase the likelihood that they will participate. However, the ESP community will need to monitor the videos and community, both to ensure to the quality of the videos presented as well as to prevent groupthink. If players all flock to one way of thinking, it may diminish the number of viable prototypes tested. This was evident in the Group 2's red forces use of a heavy machine gun to guard the prison. Once Group 2's red forces learned through the view of the videos that this option was highly successful, future users naturally chose it as an option as well.

D. FUTURE WORK

This study only scratched the surface of the effects of videos on game play in an ESP game and researchers need to conduct future studies before the data from this study can assert anything finite. In the future, studies need to increase the participant pool by using an online game that allows researchers to solicit participants remotely and allow participants to participate on their own time. This may require a less controlled experiment, but should vastly increase the number of data points for analysis. This also allows the study to get more “gamers” involved. Additionally, any follow on study should also have a real online game community where players can share their own videos without the use of researchers picking the top videos. This would eliminate the limitation of the artificial community and should increase accuracy.

APPENDIX A. BLUE OPERATIONS BRIEF

Blue Brief:

You are part of a 4 man rescue team that is stationed in the country of Ostil, right next to the Gorgas border.

Intel has just learned that Nicole Lewis, reporter for news 7, has been taken as a political prisoner in the country of Gorgas, by regular Gorgarian Army soldiers.

Lewis is being held captive in an abandoned prison complex near the Gorgarian/Ostilian border.

Currently, it is believed that she is only being held captive by a very small (2-4 soldiers) force. However, within the next few hours, she is expected to be moved to the Gorgarian capital city of Masra.

The prison complex security team is believed to be 2-4 soldiers with the capability of a QRF force to arrive in 8 minutes if they are called.

Prison guards at the complex have good communications with the QRF, therefore, QRF will most likely be called once your element is spotted or you engage the QRF.

Your mission is to conduct a rescue mission at Objective Snyder (Prison Complex) where you will need to secure the prisoner and move to PZ Nelson for extraction.

Task Org

- TF Striker
 - TF Eagle
 - 1 UH60L- M134
 - TF Wildcat
 - 4 US Soldiers.
 - 1 Weapons and Ammo create at RP.

Situation

- Nicole Lewis, reporter for news 7, has been taken as a political prisoner in the country of Gorgas, by regular Gorgarian Army soldiers.
- Lewis is being held captive in an abandoned prison complex near the Gorgarian/Ostilian border.
- Currently, it is believed that she is only being held captive by a very small (2-4 soldiers) force. However, within the next few hours, she is expected to be moved to the Gorgarian capital city of Masna.
- Prison complex security team is believed to be 2-4 soldiers with the capability of a QRF force to arrive in 8 minutes if they are called.
- Prison guards at the complex have good communications with the QRF, therefore, QRF will most likely be called once your element is spotted or you engage the QRF.

Mission

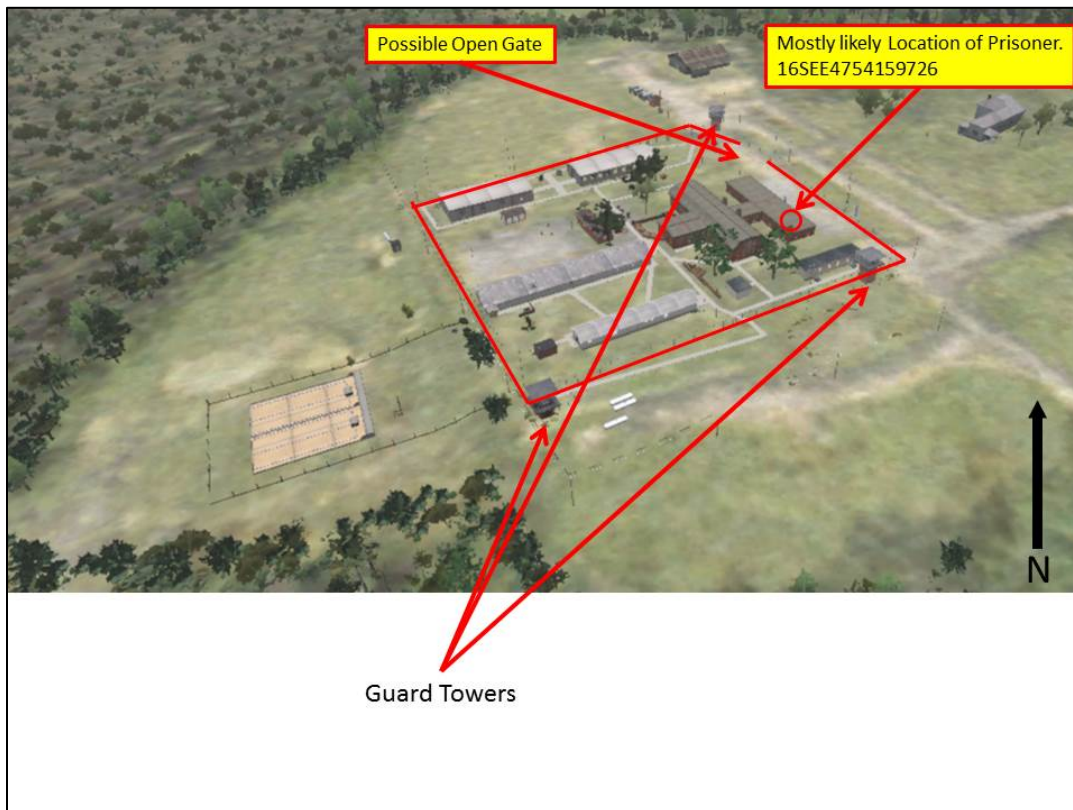
- Your mission is to conduct a rescue mission at Objective Snyder (Prison Complex) where you will need to secure the prisoner and move to PZ Nelson for extraction.

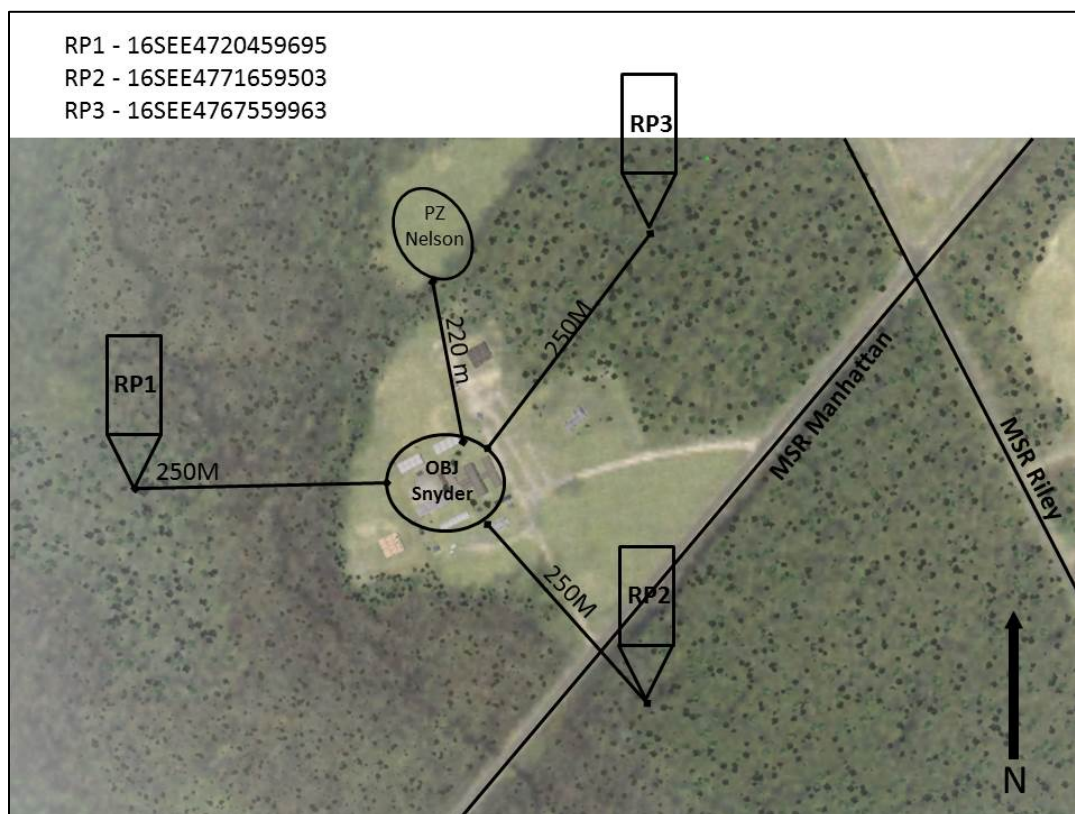
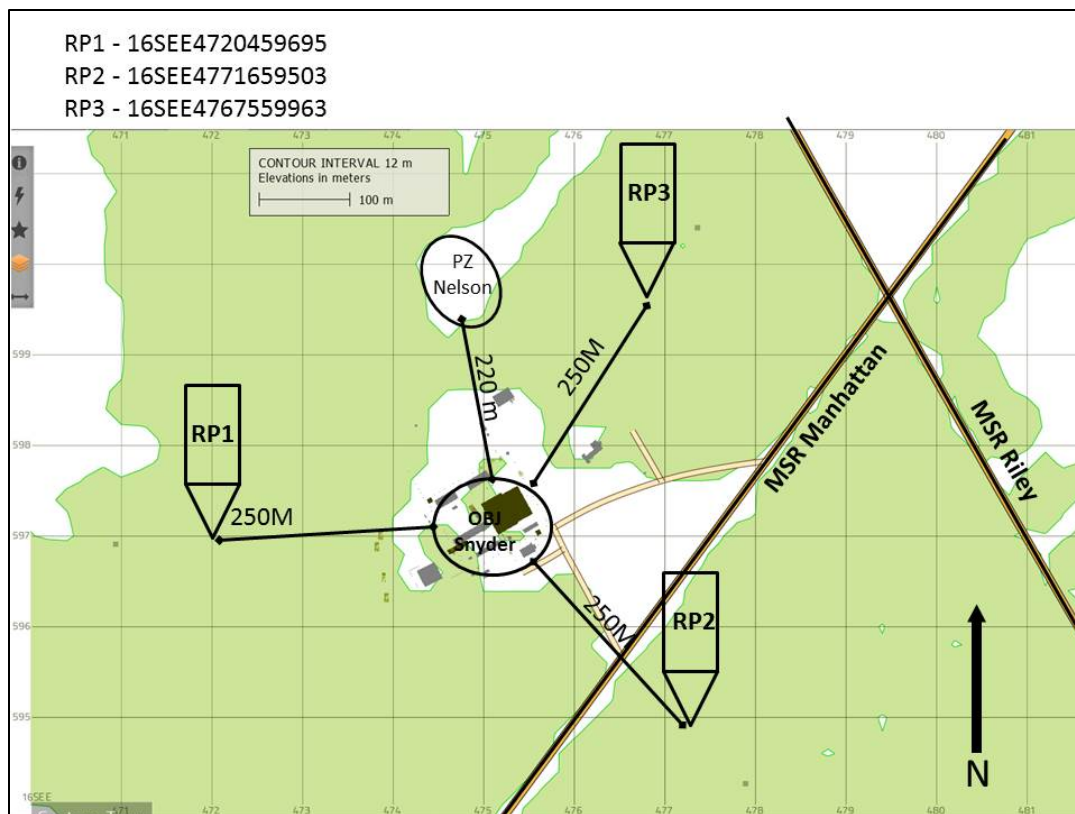
Coordinating Instruction/Support

- Select a release point for your insertion point.
- Ammo and weapons create available at your RP to acquire any additional weapons you may want.



Nicole Lewis, reporter for news 7.
Being held captive at prison complex.





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APPENDIX B. RED OPERATIONS BRIEF

Red Brief:

You are from the country Gorgas and are a member of the Gorgas military forces.

You have captured a high value target. It is an American News Reporter, Elizabeth Brown.

Your country believes this woman to be an American Spy and you have been tasked with providing security for the prisoner.

You are currently holding this prisoner in an abandoned prison complex near the border of Gorgas and Ostil, which is where you pick up and captured the American journalist.

Your country is not friendly with the United States, however you neighbor Ostil is.

Currently, there are very few US forces in the Gorgas/Ostilian Boarder region, however, a small 2-4 man rescue attempt may be likely.

You are part of a 4 man security team tasked with providing security until the prisoner can be moved to a more secure location within the next few hours

As the prison security force team lead, you will have 2 soldiers that can either be placed as roving guards or in the towers. The other 2 soldiers (you and your battle buddy) can defend from anywhere on the complex.

A QRF force is available in the event that US forces are either spotted or engage your security force, however, it will take 10 minutes for them to arrive, so you will need to ensure that the prisoner is secure until their arrival.

This prisoner is very important to the country of Gorgas, therefore, you must ensure that her safety is maintained throughout the mission. If she dies during the mission, the red will lose.

Task Org

- TF Red
 - TF QRF (10 minute delay from notification)
 - 2 UAZ-469 with DShK
 - 1 GAZ Vodnik (with 4 dismounts, commander, and driver)
 - TF Folsom
 - 4 OPFOR soldiers
 - 1 Weapons and Ammo create at RP.

Situation

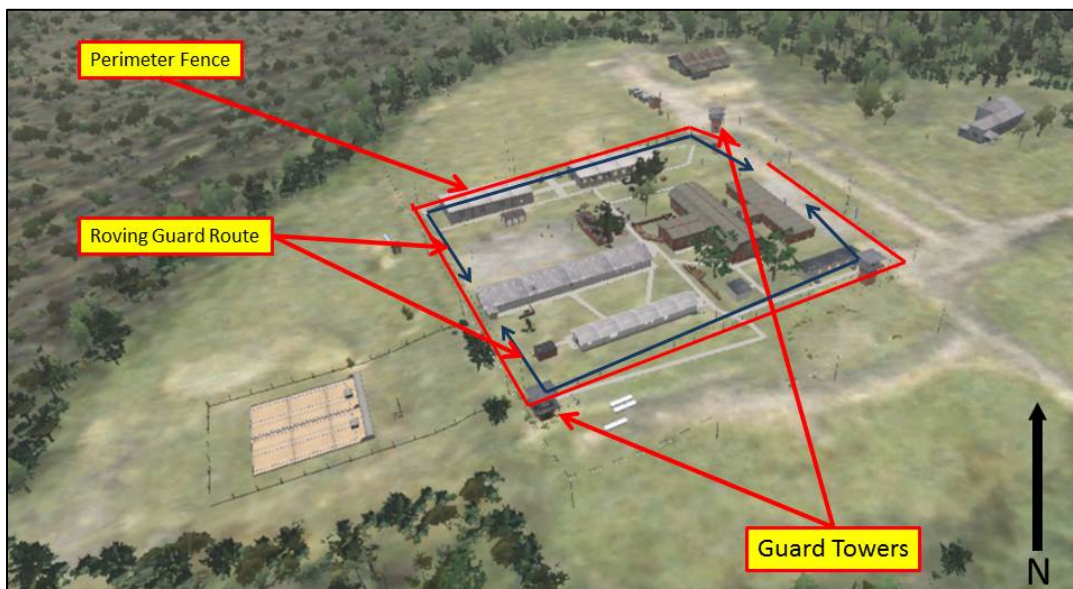
- Nicole Lewis, reporter for news 7, has been taken as a prisoner in the country of Gorgas, by regular Gorgarian Army soldiers.
- You are assigned as a prison guard where Lewis is being held captive in an abandoned prison complex near the Gorgarian/Ostilian boarder.
- You are part of a 4 man security team tasked with providing security until the prisoner can be moved to a more secure location within the next few hours
- Currently, there are very little US forces in the Gorgas/Ostilian Boarder region, however, a small 4 man rescue attempt may be likely.
- As the prison security force team lead, you will have 2 soldiers that can either be place as roving guards or in the towers. The other 2 soldiers (you and your battle buddy) can defend from anywhere on the complex.
- A QRF force is available in the event that US forces are either spotted or engage your security force, however, it will take 10 minutes for them to arrive, so you will need to ensure that the prisoner is secure until their arrival.
- This prisoner is very important to the country of Gorgas and therefore, you must ensure that her safety is maintained throughout the mission. If she dies during the mission, the red will lose.

Mission

- Choose defense strategy (either roving guards or guard towers).
- Secure prison complex and delay any blue force attack until QRF can arrive.
- Ensure prisoner's safety during the mission.

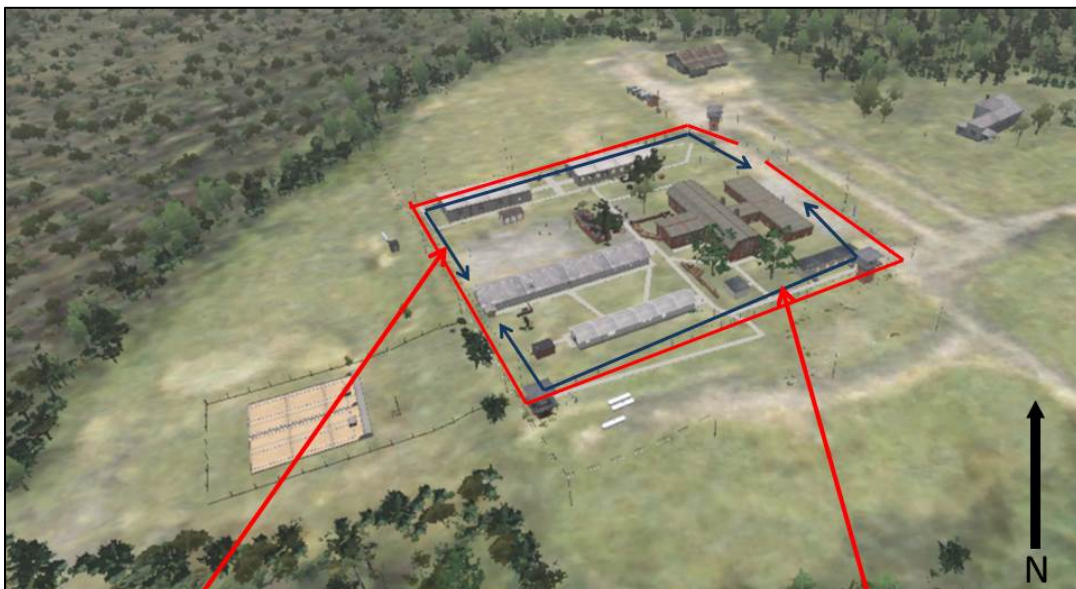


Nicole Lewis, reporter for News 7 is thought to be an American Spy.





Defense COA #1 – Use Guard towers



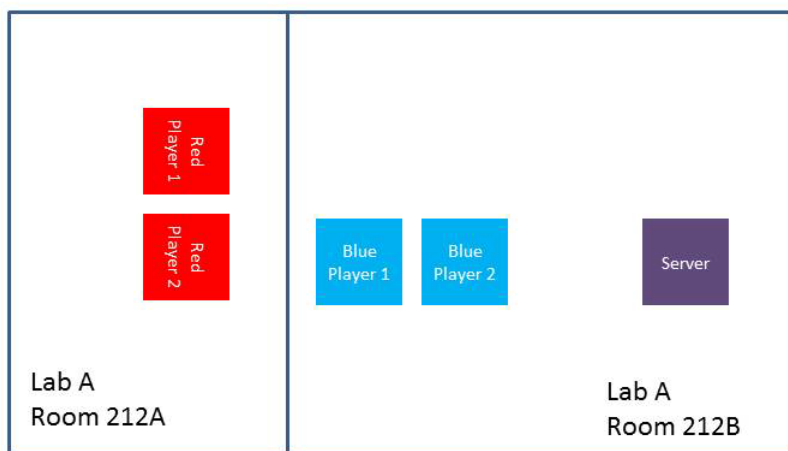
Roving Guard Route 1

Roving Guard Route 1

Defense COA #2– Roving Guards

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APPENDIX C. EXPERIMENT SESSION LAB SETUP



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APPENDIX D. DEMOGRAPHIC SURVEY

"Extracting Useful Design Information from Gameplay Videos in Early Synthetic Prototyping"

Demographic Survey

Subject #: _____

Date: _____

1. Age: _____
2. Gender: Male Female
3. Are you currently serving in the Armed Forces: Yes No
 - a. Branch: _____
 - b. Years of Service: _____
 - c. Highest Rank: _____
4. How many game consoles to you own? _____
5. How many hours per week do you play video games? _____

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APPENDIX E. POST TASK SURVEY

"Extracting Useful Design Information from Gameplay Videos in Early Synthetic Prototyping"

Post Task Survey

Subject #: _____

Date: _____

1. One a scale of 1-5 (1 being "bad" and 5 being "great") How would you rate you game experience? _____
2. One a scale of 1-5 (1 being "not fun" and 5 being "fun") How would you rate how fun the game was? _____
3. One a scale of 1-5 (1 being "not difficult" and 5 "very difficult") How would you rate difficult the videos were to create? _____
4. If video and narration creation was streamlined, would you create videos for other players to watch? Yes/No

"Extracting Useful Design Information from Gameplay Videos in Early Synthetic Prototyping"

Post Task Survey

Subject #: _____

Date: _____

1. One a scale of 1-5 (1 being "bad" and 5 being "great") How would you rate you game experience? _____
2. One a scale of 1-5 (1 being "not fun" and 5 being "fun") How would you rate how fun the game was? _____
3. One a scale of 1-5 (1 being "not useful" and 5 "very useful") How would you rate how useful the videos were to your experience? _____
4. Would you recommend watching user videos for other participants? Yes/No
5. Do you feel that the user videos influenced your decisions during mission planning? Yes/No

If yes, rate the influence on a scale of 1-5 (1 being "little influence" and 5 "highly influenced") _____
6. Do you feel that the user videos influenced your decisions during the operation? Yes/No

If yes, rate the influence on a scale of 1-5 (1 being "little influence" and 5 "highly influenced") _____
7. Do you feel that the user videos contributed to your success of failure of the operation? Yes/No

If yes, rate the contribution on a scale of 1-5 (1 being "little contribution" and 5 "high contribution") _____
8. Would you create videos for other players to watch? Yes/No

APPENDIX F. EXPERIMENT RAW DATA

Run	Red Plan	Group	Blue RP	Subjects	W/L	Age	US/IO	Sex	Active Mil	Branch	Years Service	Grade	Game Consoles	Hrs/Week Gaming	Q1	Q2	Q3-1	Q3-2	Q4	Q5	Q5a	Q6	Q6a	Q7	Q7a	Q4-8	
Run11	Tower	1	1	1	W	38	US	M	Y	Army	16	O5	3	2	4	3	4								Y		
Run11	Tower	1	1	2	W	39	IO	M	Y	Air Force	16	O4	0	0	5	5	4								Y		
Run11	Tower	1	1	3	L	30	IO	M	Y	Army	8	O2	0	0	4	4	5								Y		
Run11	Tower	1	1	4	L	36	US	M	Y	USMC	10	O3	0	0	3	4	3								Y		
Run12	Tower	1	1	5	L	38	US	M	Y	USMC	16	O4	0	2	2	1	1								N		
Run12	Tower	1	1	6	L	27	US	F	Y	Navy	4	O2	0	0	5	5	1								N		
Run12	Tower	1	1	7	W	33	US	F	Y	USMC	10	O4	0	0	4	4	3								N		
Run12	Tower	1	1	8	W	29	US	M	Y	Navy	7	O3	2	20	3	4	1								N		
Run13	Tower	1	3	9	L	35	US	M	Y	Army	14	O4	0	0	3	4	2								Y		
Run13	Tower	1	3	10	L	40	US	M	Y	USMC	15	O4	0	0	3	3	3								Y		
Run13	Tower	1	3	11	W	38	US	M	Y	USMC	15	O4	1	0	3	3	1								Y		
Run13	Tower	1	3	12	W	31	US	F	Y	USMC	10	O3	0	0	3	4	1								Y		
Run14	Tower	1	1	13	L	22	US	F	Y	NAVY	1	O1	1	0	3	3	2								Y		
Run14	Tower	1	1	14	L	33	US	M	Y	Navy	5	O3	1	10	5	5	1								N		
Run14	Tower	1	1	15	W	37	US	M	Y	Navy	15	O4	1	3	4	5	2								Y		
Run14	Tower	1	1	16	W	38	US	M	Y	Navy	12	O3	2	0	3	3	1								Y		
Run15	Tower	1	1	17	L	32	US	M	Y	USMC	7	O3	1	0	4	4	1								Y		
Run15	Tower	1	1	18	L	46	US	M	Y	ARMY	24	O5	1	7	5	4	5								Y		
Run15	Tower	1	1	19	W	32	US	M	Y	Navy	5	O3	0	0	3	4	4								Y		
Run15	Tower	1	1	20	W	33	US	M	Y	Navy	6	O3	2	0.1	4	4	2								Y		
Run21	Tower	2	2	21	L	35	IO	M	Y	Navy	19	O4	0	2.5	4	5		5	Y	Y	4	N	N	Y	4		
Run21	Tower	2	2	22	L	33	US	M	Y	USMC	11	O3	0	0	4	5		4	Y	Y	3	N	Y	4	Y		
Run21	Tower	2	2	23	W	27	IO	M	Y	Navy	5	O2	0	0.5	5	5		5	Y	N	N	N	Y	Y	Y		
Run21	Tower	2	2	24	W	32	IO	M	Y	Army	12	O2	1	4	4	5		4	Y	Y	4	N	Y	4	N		
Run22	Tower	2	1	25	W	41	US	M	Y	Army	21	O4	3	1	2	5		4	Y	Y	5	Y	5	4	Y		
Run22	Tower	2	1	26	W	29	US	M	Y	USMC	7	O3	1	0	4	4		5	Y	Y	3	N	Y	3	Y		
Run22	Tower	2	1	27	L	40	US	M	Y	Army	16	O4	2	8	5	5		5	Y	Y	4	N	Y	4	Y		
Run22	Tower	2	1	28	L	38	US	M	Y	USMC	13	O4	1	4	4	4		3	Y	Y	3	Y	3	Y	3		
Run23	Tower	2	3	29	W	43	US	M	Y	Army	21	O5	1	0.5	5	4		5	Y	Y	5	Y	4	Y	4		
Run23	Tower	2	3	30	W	32	US	M	Y	Army	10	O4	0	0	3	5		4	Y	Y	4	Y	4	Y	4		
Run23	Tower	2	3	31	L	28	US	F	Y	Navy	6	O3	0	0	5	5		5	Y	Y	5	Y	5	N	Y		
Run23	Tower	2	3	32	L	36	US	M	Y	Army	13	O4	2	3.5	4	5		4	Y	Y	4	Y	4	Y	4		
Run24	Tower	2	3	33	W	29	US	M	Y	Navy	5	O3	3	15	4	4		4	Y	Y	3	Y	3	Y	3		
Run24	Tower	2	3	34	W	28	US	M	Y	Navy	6	O3	2	10	2	3		2	Y	Y	3	N	N	Y	Y		
Run24	Tower	2	3	35	L	28	US	M	Y	USMC	6	O3	1	3	4	4		3	Y	Y	3	Y	2	Y	2		
Run24	Tower	2	3	36	L	30	US	M	Y	Navy	8	O3	3	21	5	5		4	Y	Y	3	Y	3	Y	4		
Run25	Rover	2	2	37	W	44	US	M	Y	USMC	21	O4	1	1	1	4		4	Y	Y	3	Y	4	Y	4		
Run25	Rover	2	2	38	W	40	CIV	M	N				2	0.5	4	3		5	Y	Y	5	N	3	Y	5		
Run25	Rover	2	2	39	L	34	CIV	M	N				10	12.5	5	5		5	Y	Y	3	N	N	N	N		
Run25	Rover	2	2	40	L	49	CIV	M	N				1	3	4	4		5	Y	Y	4	Y	4	Y	3		
Group1 Totals															34.4	3.7	3.8	2.4	4.3	1	0.95	3.7	0.55	3.7	0.8	3.8	0.75
Group2 Totals															34.8	4.1	4.5										0.70
Totals															34.6	3.9	4.2										0.725

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LIST OF REFERENCES

- Berg, M. (2015, October). The world's highest-Paid YouTube stars 2015. *Forbes*. Retrieved from <http://www.forbes.com/sites/maddieberg/2015/10/14/the-worlds-highest-paid-youtube-stars-2015/#6c20d008542c>
- Bohemia Interactive Simulations. (n.d.). Retrieved March 3, 2016 from <https://bisimulations.com/virtual-battlespace-3>
- Department of the Army, Training and Doctrine Command (TRADOC). (2014). *The U.S. Army Operating Concept—Win in a Complex World*. (TRADOC Pamphlet 525–3-1). Fort Eustis, VA: U.S. Army Training and Doctrine Command.
- Entertainment Software Association (ESA). (2015). Essential facts about the computer and video game industry: 2015 sales, demographic, and usage data. Retrieved from <http://www.theesa.com/wp-content/uploads/2015/04/esa-essential-facts-2015.pdf>
- Iannitti, N. (2015, March). I like to watch—the psychology behind “let’s plays” and spectator culture generation play, 1 (3) Retrieved from <http://generationplaymagazine.com/article/i-like-to-watch/>
- Mackey, B. (2011). We like to play—spectator gaming: they play, so you don’t have to. Retrieved from <http://www.1up.com/features/lets-play-lp-fan-walkthroughs>
- McConnell, F. (2014, January). Let’s play— the YouTube phenomenon that’s bigger than One Direction. Retrieved from: <https://www.theguardian.com/technology/2014/jan/02/lets-play-youtube-pewdiepie-one-direction>
- Murray, K. L. (2014). Early synthetic prototyping: exploring designs and concepts within games. (Master’s thesis). Retrieved from Calhoun <http://hdl.handle.net/10945/44627>
- Murray, K., Darken, R., Vogt, B., & Goerger, S. (2014). Early synthetic prototyping: exploring new designs and concepts within games. In *Proceedings of the Interservice/Industry Training Simulation and Education Conference (IITSEC) 2014*. Orlando, FL. Retrieved from: <https://www.milsuite.mil/book/docs/doc-220996>
- Perkins, D. (2014). Army operating concept and force 2025 & beyond. [PowerPoint slides]. Retrieved from <http://www.benning.army.mil/mcoe/maneuverconference/2014/presentation/pdf/genperkins.pdf>

- Richmond, T. (n.d.). Early Synthetic Prototyping (ESP). Retrieved March 4, 2016 from USC Institute for Creative Technology: <http://ict.usc.edu/prototypes/early-synthetic-prototyping-esp/>
- SocialBlade. (2016). Top 100 YouTubers. Retrieved on May 18, 2016 from: <http://socialblade.com/youtube/top/100/mostsubscribed>
- Vogt, B. (2013). ARCIC to leverage early synthetic prototyping to shape the future of the army. [Information Paper]. Retrieved from <http://www.arcic.army.mil/articles/cdd-arcic-to-leverage-early-synthetic-prototyping-to-shape-the-future-army.aspx>
- Vogt, B. (2016). Early Synthetic Prototyping (ESP) Information Paper. [Information Paper]. Retrieved from <https://www.milsuite.mil/book/docs/doc-256093>
- Vogt, B., Darken, R., McGroarty, R., Smith, R., Perriello, D., & Phillips, Z., (2014). Early Synthetic prototyping: Force 2025 capability development driven by warfighters using games—A Community of Interest Program for I/ITSEC 2014. [PowerPoint slides]. Retrieved from <https://www.milsuite.mil/book/docs/doc-180441>
- Vogt, B., Megiveron, M., & Smith, R. (2015). Early Synthetic Prototyping: when we \build it, will they come? In *Proceedings of the Interservice/Industry Training Simulation and Education Conference (I/ITSEC) 2015*. Orlando, FL. Retrieved from: <https://www.milsuite.mil/book/docs/doc-220993>

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